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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/544,822	04/06/2000	Tongbi Jiang	4241 US	9308
7590	02/24/2004			
James R Duzan Trask Britt & Rossa P O Box 2550 Salt Lake City, UT 84110				
			EXAMINER GRAYBILL, DAVID E	
			ART UNIT 2827	PAPER NUMBER

DATE MAILED: 02/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/544,822

Applicant(s)

JIANG, TONGBI

Examiner

David E Graybill

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5 and 7-63 is/are pending in the application.
- 4a) Of the above claim(s) 33-57 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 7-32 58-63 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                                    | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12-2-3 has been entered.

Prosecution is being continued on group I, claims 1-5, 7-32 and 58-63, the invention elected and prosecuted by applicant in the parent application, and confirmed in the remarks entered 11-17-3.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-5, 7-32 and 59-63 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1 and 10 the scope of the term "liquid-wetting agent layer" is confusing and unclear because the term "liquid-wetting" appears to be improperly hyphenated. To further clarify, compound words are customarily created by hyphenating modifiers before nouns; therefore, the term "liquid-wetting" appears to improperly describe a liquid-wetting property of the agent layer, rather than the originally disclosed liquid property of the wetting agent layer.

In claim 9 the limitation, "increasing surface tension to one of said surface of said semiconductor device and said surface of said substrate" is unclear and incorrect because the property of surface tension is not a transferable property and it cannot be modified to a surface.

The following lack sufficient antecedent basis:

Claims 3-9, 59-61 and 63, "said liquid wetting agent layer";

Claim 62, "said applied wetting agent layer."

In the rejections infra, reference labels are generally recited only for the first recitation of identical claim language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 5, 7, 9-12, 15, 22 and 58-60 rejected under 35 U.S.C. 103(a) as being unpatentable over Dery (6074895) and Higgins (5492863).

At column 1, lines 51-62; column 2, line 52 to column 5, line 11; column 5, lines 51-59; and column 6, lines 13-54, Dery teaches the following:

A method for applying a material between a semiconductor device having a surface and a substrate having a surface, said method comprising:

applying a liquid-wetting agent layer 111, 124 (before or after plasma treatment) to one of said surface of said semiconductor device 110 and said surface of said substrate 120; and applying a flowable material 140 between the substrate and the semiconductor device, such that said flowable material contacts said wetting agent layer; wherein said semiconductor device is attached to said substrate, wherein said applying said liquid wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method, wherein said liquid wetting agent layer comprises at least one layer, wherein said liquid wetting agent layer comprises a plurality of layers, and wherein said applying said liquid wetting agent layer comprises providing a material for increasing the surface tension to one of said surface of said semiconductor device and said surface of said substrate for the application of an underfill material.

A method for applying a material between a semiconductor device and a substrate, said method comprising: providing a semiconductor device having an active surface, another surface, a first end, a second end, a first lateral side, and a second lateral side "all four sides", said first end, said second end, said first lateral side, and said second lateral side forming at least a portion of a periphery of said semiconductor device; providing a substrate having an upper surface, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall; applying a liquid-wetting

agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate; and applying a flowable material between said semiconductor device and said substrate, such that said flowable material contacts said applied wetting agent layer; wherein said flowable material is applied substantially adjacent to at least one end of said semiconductor device, wherein said flowable material substantially fills a gap between said semiconductor device and said substrate, wherein said flowable material is provided substantially adjacent to said at least a portion of the periphery of said semiconductor device to fill a gap between said substrate and said semiconductor device, and wherein said applying said flowable material comprises: providing said flowable material substantially adjacent said first end "one or more edges" of said semiconductor device for filling between said substrate and said semiconductor device by one or more forces acting upon said flowable material.

A method for attaching a semiconductor assembly, said method comprising: providing a semiconductor device having an active surface; providing a substrate having an upper surface; applying a wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate; connecting said semiconductor device to said substrate so that said active surface of said semiconductor device faces said upper surface of said substrate; and applying a flowable underfill

material between the substrate and the semiconductor device, such that said flowable underfill material contacts said applied wetting agent layer; wherein applying said liquid wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method, and wherein said liquid wetting agent layer comprises at least one layer.

However, Dery does not appear to explicitly teach applying a liquid wetting agent layer.

Nonetheless, as cited, Dery teaches that the wetting agent layer is an epoxy resin solder mask and polyimide. In addition, at column 4, line 59 to column 5, line 7; and column 5, line 54 to column 6, line 3, Higgins teaches application of a liquid epoxy resin solder mask and polyimide. Moreover, it would have been obvious to combine the process of Higgins with the process of Dery because it would enable application of the wetting agent layer of Dery.

To further clarify the teaching wherein said applying said liquid wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method, it is noted that it is inherent in the process that the layer is dealt out in portions; therefore, it is inherent that the layer is dispensed. In any case, as cited, Higgins teaches application of liquid epoxy resin solder mask and polyimide using a dispensing and a spraying method, and it would have been obvious to combine the process of Higgins with the

process of Dery because it would enable application of the wetting agent layer of Dery.

Claims 3, 8 and 61-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dery and Higgins as applied to claims 1, 2, 4, 5, 7, 9-12, 15, 22 and 58-60 and further in combination with Plueddemann (4231910).

Dery and Higgins do not appear to explicitly teach the following:

The method wherein said liquid wetting agent layer includes a layer of silane-based material, wherein said liquid wetting agent layer comprises one of glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane, and wherein said liquid wetting agent layer comprises one of silane, glycidoxypropyltrimethoxysilane, and ethyltrimethoxysilane.

A method for attaching a semiconductor assembly, said method comprising: applying a silane-based material layer to one of a portion of said active surface of said semiconductor device and a portion of said upper surface of said substrate, wherein said liquid wetting agent layer comprises one of glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane.

Nonetheless, at column 1, lines 5-8, 21-23 and 55-63; column 2, lines 5-49; column 3, lines 22-54; column 3, line 65 to column 4, line 10; column 4, lines 24-27 and 58-62; and column 7, line 4 to column 8, line 5, Plueddemann teaches wherein a liquid wetting agent layer comprises one of glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane.



In addition, it would have been obvious to combine the process of Plueddemann with the process of Dery and Higgins because both Plueddemann and Dery are drawn to improving adhesion of a plastic, and the process of Plueddemann would improve the adhesion of the plastic of Dery.

In addition, it has been held that it is obvious to combine two processes for the same purpose. In re Novak 16 USPQ2d 2043. Similarly, "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose . . . . [T]he idea of combining them flows logically from their having been individually taught in the prior art." In re Kerkhoven, 626 F.2d 846, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted) (Claims to a process of preparing a spray - dried detergent by mixing together two conventional spray - dried detergents were held to be prima facie obvious.). See also, In re Crockett, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) (Claims directed to a method and material for treating cast iron using a mixture comprising calcium carbide and magnesium oxide were held unpatentable over prior art disclosures that the aforementioned components individually promote the formation of a nodular structure in cast iron.); and Ex parte Quadranti 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992) (Mixture of two known herbicides held prima facie

obvious). Therefore, it would have been obvious to combine the layers of Plueddemann and Dery, for example, by forming a mixture comprising the two layers, or by using the two layers in conjunction. Incidentally, when the two layers are used in conjunction, the liquid wetting agent layer comprises a plurality of layers.

Claims 13, 14, 16-21, and 23-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dery and Higgins as applied to claims 1, 2, 4, 5, 7, 9-12, 15, 22 and 58-60 *supra*, and further in combination with Akram (5766982).

Dery and Higgins do not appear to explicitly teach the following:

The method wherein said substrate includes an aperture extending through said substrate, wherein said aperture is located adjacent to said another surface of said semiconductor device, further comprising: elevating at least said first side wall of said substrate and said first end of said semiconductor device, wherein said elevating said first side wall of said substrate comprises placing said substrate on a support structure and elevating at least one portion of said support structure, further comprising: providing a dam on the substrate adjacent to at least one of said first end, said second end, said first lateral side and said second lateral side of said semiconductor device, wherein said dam extends to substantially between said semiconductor device and said substrate, further comprising: vibrating

one of said semiconductor device and said substrate, wherein said vibrating one of said semiconductor device and said substrate comprises placing said substrate on a support structure and vibrating said support structure, wherein said substrate includes at least one aperture extending through said substrate and substantially located adjacent to said another surface of said semiconductor device, wherein said flowable material is provided through said at least one aperture of said substrate substantially filling a gap between said substrate and said semiconductor device, wherein said substrate includes at least one aperture extending therethrough and substantially located adjacent to said another surface of said semiconductor device, wherein said flowable material is provided from below said substrate, and wherein said flowable material is provided through said at least one aperture contacting at least a portion of said another surface of said semiconductor device.

Nevertheless, at column 4, line 36 to column 7, line 17, Akram teaches a process wherein a substrate 10 includes an aperture extending through a substrate, an aperture 60 is located adjacent (nearby) to another surface of a semiconductor device 12; elevating at least a first side wall of the substrate and a first end of the semiconductor device, wherein elevating a first side wall of the substrate comprises placing the substrate on a support structure 44 and elevating at least one portion of a support structure;

providing a dam 40 on the substrate adjacent to at least one of a first end, a second end, a first lateral side and a second lateral side of a semiconductor device, wherein a dam extends to substantially between a semiconductor device and a substrate; vibrating 48 one of a semiconductor device and a substrate, wherein vibrating one of a semiconductor device and a substrate comprises placing a substrate on a support structure and vibrating a support structure, wherein a flowable material 28 is provided through at least one aperture of a substrate substantially filling a gap 26 between a substrate and a semiconductor device, and wherein a flowable material is provided through a at least one aperture contacting (at least indirect physical contact and thermal contact) at least a portion of another surface of a semiconductor device.

Moreover, it would have been obvious to combine the process of Akram with the process of Dery and Higgins because it would facilitate applying the flowable material 140 between the substrate and the semiconductor device.

Also, in the combination, Dery teaches the following:

The method wherein a applying a flowable material comprises: providing a flowable material substantially adjacent to a first end of a semiconductor device for filling a gap between a substrate and a semiconductor device, wherein said applying said flowable material

comprises: providing said flowable material substantially adjacent to said first end and one of said first lateral side and said second lateral side of said semiconductor device for filling a gap between said substrate and said semiconductor device, and wherein a flowable material is provided from below a substrate.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dery and Higgins as applied to claims 1, 2, 4, 5, 7, 9-12, 15, 22 and 58-60 supra, and further in combination with Banerji (5203076).

Dery and Higgins do not appear to explicitly teach the following:

The method wherein said applying said flowable material between said semiconductor device and said substrate further comprises placing said semiconductor device and said substrate in a chamber, said chamber having an atmosphere therein having a variable pressure, further comprising: varying the pressure of said atmosphere in said chamber for said flowable material substantially filling a gap between said semiconductor device and said substrate.

Regardless, at column 2, lines 55-68; and column 3, lines 1-10, Banerji teaches a process wherein applying a flowable material 22 between a semiconductor device 10 and a substrate 20 comprises placing the semiconductor device and the substrate in a chamber 32 having an atmosphere therein having a variable pressure, and varying the pressure of

the atmosphere in the chamber for the flowable material substantially filling a gap 18 between the semiconductor device and the substrate.

Furthermore, it would have been obvious to combine the process of Banerji with the process of Dery because it would facilitate applying the flowable material 140 between the substrate and the semiconductor device.

Applicant's amendment and remarks filed 11-17-3 have been fully considered, and are addressed *supra* and *infra*.

Applicant argues that Dery and Higgins are nonanalogous art.

This argument is respectfully traversed because it has been held that a prior art reference must either be in the field of applicant's endeavor or, if it is not, then it must be reasonably pertinent to the particular problem with which applicant was concerned in order to be relied upon as a basis for rejection of the claimed invention. In *re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). In the instant application, both Dery and Higgins are in the field of applicant's endeavor; namely, as disclosed in the specification, "Field of the Invention," at page 2, lines 3-4, the field of "semiconductor die or semiconductor devices, mounted on substrates," and the field of "a method . . . for underfilling the gap between a bumped or raised semiconductor die or semiconductor device and a substrate." Moreover both Dery and Higgins are in the field of applicant's endeavor as set forth in the claim preambles, "a method for attaching a semiconductor

assembly," and, "a method for applying a material between a semiconductor device having a surface and a substrate having a surface." Furthermore, both Dery and Higgins are reasonably pertinent to a particular problem with which applicant is concerned; namely, the improvement of adhesion of plastic layers, and the deposition of liquid layers, respectively.

Applicant also alleges that Higgins discloses "a layer which is heavily impregnated . . . with conductive material," that Higgins teaches away from combining this layer with Dery, and that the combination would not provide the alleged benefits of the instant invention.

These allegations are respectfully deemed to be unpersuasive because, as cited, Higgins discloses a broad range of materials and is not necessarily applied to the rejection of the claims for the teaching of a layer which is heavily impregnated with conductive material.

In addition, applicant asserts that Plueddemann does not teach "adhesion of anything to a silane-based wetting layer because any enhanced bonding referred to in the reference is due to curing. It is not due to a wetting layer which lowers the surface tension of a material flowing across it."

This assertion is respectfully deemed to be unpersuasive because the claims are not limited to adhesion of anything to a silane-based wetting layer wherein any enhanced bonding referred to in the reference is not due

to curing, but is due to a wetting layer which lowers the surface tension of a material flowing across it, and Plueddemann is not necessarily applied to the rejection of the claims for this disclosure. In any case, at column 3, lines 22-24, Plueddemann teaches "both wet and dry adhesion" to the wetting layer.

Applicant also argues Plueddemann does not teach that the wetting agent layer includes a layer of silane-based material because, allegedly, "the composition which would be characterized as a 'wetting layer' would actually be a combination of a silane and other components, with the silane part being only 1 to 25 percent by weight."

This argument is respectfully deemed unpersuasive because the allegation that the composition which would be characterized as a wetting layer would be a combination of a silane and other components, with the silane part being only 1 to 25 percent by weight, does not preclude the disclosure of Plueddemann of a silane-based layer. Indeed, as applied to the rejection, Plueddemann discloses that the wetting agent layer comprises one of glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane, and in the specification, at page 10, lines 11-13, applicant discloses that glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane are silane-based materials. In any case, as disclosed at column 2, lines 40-49, the wetting agent layer of Plueddemann is not limited to a composition which would be a



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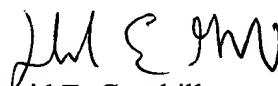
combination of a silane and other components, with the silane part being only 1 to 25 percent by weight, and Plueddemann is not necessarily relied on for a disclosure of this limitation.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any telephone inquiry of a general nature or relating to the status (MPEP 203.08) of this application or proceeding should be directed to Group 2800 Customer Service whose telephone number is 571-272-2815.

Any telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (571) 272-1930. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.

The fax phone number for group 2800 is (703) 872-9306.



David E. Graybill  
Primary Examiner  
Art Unit 2827

D.G.  
20-Feb-04